Wireless Solutions for Public Safety and Video Surveillance
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Agenda

- Market and Industry Trends
- Applications and Business Value
- Traffic Monitoring Examples
- VMD Monitoring Examples
- The Wireless Solution
- Deployment Considerations
- Network Topology Examples
- The Alvarion Solution
- Case Studies
Market and Industry Trends
Market Overview: Video Surveillance

Video Everywhere
- Recent homeland security threats increase popularity of video surveillance solutions
- Video surveillance is now a routine component of security planning
- Video surveillance is now a component of a larger ecosystem

Beyond Homeland Security
- Video surveillance goes beyond homeland security
- Video surveillance solutions are an integral part of municipal and corporate security solutions

Market Trends
- Video surveillance is going IP
- Video is one element of a larger, integrated application solution, including camera, storage, software and backhaul
- Solutions are becoming more demanding; more cameras, higher resolutions, remote locations
Market Overview: Trends

Market Trends

- Public safety and video surveillance are becoming one and the same
  - Almost all security solutions include video surveillance elements
  - Decision makers often use both terms as one
  - Video surveillance is all about solutions. Not only product integration

Despite current financial conditions: video surveillance projects growth ratio continues to rise

Source: IMS Research, NOV 2008
Market Overview: Market Drivers (1)

**Political and governmental**
- Public demand for security
- Demand for instant information and live monitoring
- Video media being used as evidence in courts
- Reduced expected emergency response time

**Governments drive new standards**
- New strict regulations on technology compliance

**Enterprise**
- Security as a business requirement
- Budgeted allocation by same criteria as other business expenses
Market Overview: Market Drivers (2)

- **Video technology**
  - Advances in video technology, from analog to digital
  - Advances in storage and retrieval systems
  - All IP-based digital surveillance video systems now available

- **IT technology**
  - Responsibility for video surveillance projects shifting from security to IT department
  - As video surveillance products are more available, more end-users can share it (risk management, performance analysis, marketing etc.)

### Video Capture
- × Analog cameras
- √ IP/Network cameras

### Connectivity
- × Coax, separate power cabling
- √ UTP with Power over Ethernet (POE)

### Storage
- × Tapes in VCRs, hard drives in DVRs
- √ Central RAID/NAS/SAN high availability

### Video Analytics
- × Central, server-based
- √ Anywhere on network (camera, DVR, analytics gateway, central server)
Market Overview: IP vs. Analog

US market for video camera by type

IMS research 2007
The Video Surveillance Ecosystem

- Municipality
  - Consultant
  - Police Department
  - System Integrator
    - Camera Vendor
    - Storage Vendor
    - Software Vendor
    - Carrier / Media
Applications and Business Value
Surveillance Monitoring

**Deployments**
- Video cameras deployed in strategic locations within municipal areas
- Wireless broadband networks connects all cameras to control room for monitoring

**Business Benefits**
- Reduce crime and vandalism
- Extended reach: achieve visibility in municipal areas
  - Increase police force efficiency: replace patrolmen
  - Increase crime prevention: system works as a deterrent
Traffic Monitoring

Deployments

- Video cameras deployed in strategic traffic locations such as main roads, junctions and tunnels
- BWA networks support high capacity streaming from clusters of cameras or alternatively support camera PTZ motion control

Business Benefits

- Reduce traffic jams and pollution
- Become proactive: identify potential traffic jams before they form
- Increase decision making performance by having real time images from all traffic
Advanced Traffic Monitoring

Deployments

- Automated system software features intelligent video support: ANPR, VMD
- Combines system with other sensors (such as touch sensors) connected to network

Business Benefit

- Save manual monitoring time by applying event triggering
- Increase online detection and save resources by using automated detection
- Use of Automatic Number Plate Recognition (ANPR) for spotting suspicious vehicles or for charging in toll roads/parking lots
- Support off-line police detection: archived materials serve as evidence for crime activities
Traffic Monitoring Examples
VMD in Traffic Monitoring: Automation

- Save resources by applying automated monitoring
- System configured to identify passing vehicles
- System alarms when cars travel in wrong direction
VMD in Traffic Monitoring: Automation

- Save resources by applying automated monitoring
- System configured to identify passing vehicles
- System increases counters and can alert on upcoming conjunction
Use of ANPR: Automatic Number Plate Recognition for spotting suspicious vehicles
- System is configured to recognize plate number and search in vehicle database
VMD Monitoring Examples
VMD in Advanced Monitoring
Event Triggering

- Save manual monitoring time by applying event triggering
  - System identifies event and displays relevant camera screenshot
- Video example: motion detection
  - System identifies object motion
VMD in Advanced Monitoring
Event Triggering

- Save manual monitoring time by apply event triggering
  - System identifies event and displays relevant camera screenshot
- Video example: speed control
  - System identifies speeding object
Advanced Monitoring: Event Triggering

- Save manual monitoring time by applying event triggering
  - System identifies event and displays relevant camera screenshot
- Video example: access violation
  - System identifies border crossing
Wired Video Surveillance Challenges

- Wired link is unavailable
- High deployment costs (CAPEX)
- High operation costs (OPEX)
- Time consuming deployments
- Cable route regulatory delays
- Limited flexibility for changes
- Limited scalability
- No Security
Wireless Video Surveillance Benefits (1)

- No need for wired links
- Low deployment costs (CAPEX)
- Low operation costs (OPEX)
- Fast deployment time
- No need for cable route approval
- Flexibility and scalability
- Secured connectivity
- Mobile and portable options
Wireless Video Surveillance Benefits (2)

**Cost Effective**
- No recurring charges ➔ fast Return on Investment (ROI)
- Simple to deploy: no trenching, no permits, no hassles

**Robust**
- Reliable
- Inherently secure
- All-outdoor solution

**Flexible and Scalable**
- Ability to deploy anywhere within coverage area
- End point can be relocated
- Supports nomadic/mobile connectivity

**Mobile**
- Wireless is only choice for mobile connectivity
- Supports both portability and full mobility

**High Capacity**
- Capacity adjusted more easily in wireless networks
Deployment Considerations
### Deployment Considerations (1)

#### End-user application supported by system
- Monitoring
- VMD
- ANPR
- Face recognition

#### End-user application determines VS solution characteristics
- Video feed characteristics
  - Resolution
  - Frames Per Second
  - CODEC
- Camera type
  - Analog or digital
  - Encoders/decoders
  - Zoom ratio,
  - Night vision
Deployment Considerations (2)

Camera Motion and Control
- Pan/tilt/zoom
- Dome
- Wide lens camera

Network Type
- Dedicated or shared
- Security
- Wi-Fi

Solution Physical Measures
- Size and weight
- Operating temperature
- Suitable for outdoor deployments

Software and Hardware
- Storage: DVR and NVR
- Video management software

Power
- Power over Ethernet (PoE)
- External source (adjustable to carrier CPE)
# Bandwidth Consumption

## Methods for calculating bandwidth consumption

<table>
<thead>
<tr>
<th>Factor</th>
<th>Description</th>
<th>Example</th>
</tr>
</thead>
<tbody>
<tr>
<td>Video compression method</td>
<td>Spatial or temporal compression</td>
<td>(H-264/MPEG-4, MPEG-2), jpeg</td>
</tr>
<tr>
<td>Frame rate per second</td>
<td>1–30 FPS</td>
<td>5-15 for monitoring; 20–25 for highway ANPR</td>
</tr>
<tr>
<td>Image resolution</td>
<td>Number of horizontal and vertical pixels</td>
<td>QCIF - 176x144; CIF - 352x288 (default); 4CIF – 704 x 576 (D1); MegaPix -1280 x 1024 and higher</td>
</tr>
<tr>
<td>Scene activity level</td>
<td>Amount of camera activity</td>
<td>In schools 08:00 – 16:00; Traffic monitoring – during rush-hour</td>
</tr>
</tbody>
</table>

- CIF at 25 fps MPEG4 at 700 Kbps average
- 2CIF at 25 fps MPEG4 at 1250 Kbps average
- 4CIF at 25 fps MPEG4 at 2.5 Mbps average
Network Topology Examples
Network Topology for Video Surveillance

- Two BST with three sectors each
- Each sector has a high performance camera with uplink of up to 4 Mbps
- Each BST is connected to a monitoring center by a high capacity PtP link
- Results in total network utilization of around 100Mbps
Video should be recorded in high quality and must be available to view at any given time.

Video server position at center is typical with analog video.

All VMD or ANPR are done in center and can cause storage / processing / network conjunction.
Modern DVR/NVR enable moving video server forward towards cameras

Images are recorded in high quality but feed to center is either in lower resolution or lower FPS resulting in lower network consumption

High quality feed is transmitted to operator either on demand or when event occurs (VMD / ANPR)
Today some IP cameras can store up to several days of high quality video internally and cameras have VMD processors.

- Allows for flexibility in designing networks and positioning recording servers.
- Lower throughput from carrier end.
The Alvarion Solution
Technology Superiority

Video Streaming Features
- Application specific Quality of Service (QoS), jitter, latency
- Required prioritizing of network traffic

Alvarion’s Offering
- Optimized uplink/downlink values for maximum use of bandwidth
  - using CIR/MIR setting
- QoS features assure premium video streaming
- High throughput supporting high resolution videos
  - Up to 70 Mbps
- Low latency for seamless delivering of voice and video
  - Low latency of 5-7 milliseconds
  - Low jitter of 2 milliseconds
- Secure connection using strict standards
  - AES 128 bit encryption
  - FIPS-197 compliance
- Increased range for full coverage
  - Up to 50 km
- Non-Line-Of-Sight (NLOS) for maximum flexibility of camera locations
  - Using OFDM technology
Installation Comparison: LOS vs. NLOS

LOS requirements: 95% clearance of first Fresnel Zone

High mast is required

LOS technology: more CPE installations would require a mast

Installation of a LOS CPE

NLOS requirement: 0% clearance

BreezeACCESS® VL SU-Video wall installation

Wall mounting installation
- Fast
- Simple
- Low Cost
- Wherever needed

Installation of VL CPE
Wireless Portable Cameras

- Full cell power
- Solar power
BreezeACCESS® VL SU-Video

- Premium 5 GHz PtMP solution
- Optimized bandwidth for video surveillance applications
- QoS for video streaming and voice
- Secured connectivity
- Carrier-class outdoor link reliability and availability
- Ultimate versatility and robustness

Feature Highlights
- Based on OFDM technology
- Coverage range of up to 30 km
- Capacity of up to 32 Mbps per sector
- Configurable MIR/CIR per CPE per direction

Value Proposition
- Supreme range and capacity
- Versatility
- Superior robustness and security
- Fast deployment
- Superior QoS for video streaming
Ecosystem True Player

- Alvarion is an ecosystem player
- Proven interoperability with major camera vendors (Bosch, Sony, Pelco, Axis, Mobotix)
- Preferred BWA provider for major global and local video surveillance and system integrators
  - IBM, HP, Dimension Data, CSST
Case Studies
WiMAX solution for intelligent transport management

Challenge

- To provide a cost-effective and reliable connectivity solution to support an Urban Traffic Management Control (UTMC)
- Using newly available 3.3 GHz frequency
- Using bandwidth-intensive digital CCTV systems
- Traffic light and road sensors to utilize same CCTV infrastructure
- Link reliability is crucial

Solution

- Alvarion WiMAX solution
- All traffic information captured by cameras, SCOOT system and traffic signals (26 different systems) can be consolidated in a central control room
  - 40 cameras
  - 130 traffic light sensors
  - Car park sensors counting number of cars
- Ability to use wireless network for future use
  - CCTV on buses
  - WIFI on buses
Fish Farm (Spain)

Combined Wi-Fi - RAN solution provides security and operational benefits

**Challenge**
- Major farmed fish producer in Spain
- Offices and warehouse are located 2 miles inland, with fish farm facilities sited 6 miles offshore
- Frequent incidents of fish theft in farms mandated a security solution
  - Offshore patrols were partly successful but proved too costly
  - Decided that a CCTV monitoring system was required
- Required: connectivity solution between farms and main office, including underwater connectivity to Wi-Fi cameras

**Solution**
- Alvarion’s BreezeNET®
  - Equipment is waterproof and robust (IP67 certified)
  - One day installation
  - Coverage range: 13 km (farm at sea and offices), NLOS
- **Benefits**
  - Better communication between HQ and onshore workers
  - Increased productivity → Increased revenues
  - Remote security: no loss of fish to poachers
Monitoring Fish Farms at Sea

- Installations in buoys
- 12 VDC power supply

Above and below water cameras + IP encoders + Alvarion
Securing the City of Caravaggio

<table>
<thead>
<tr>
<th>Customer Type</th>
<th>Municipality/Law Enforcement</th>
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<tbody>
<tr>
<td>Country / Region</td>
<td>Caravaggio, Italy</td>
</tr>
<tr>
<td>URL</td>
<td><a href="http://www.poliziacolli.it">http://www.poliziacolli.it</a></td>
</tr>
<tr>
<td>Application</td>
<td>Broadband data for law enforcement officers in the field</td>
</tr>
</tbody>
</table>

- Inter-municipal Police Force Association-province of Bergamo-Lombardy Region
- Video-surveillance in area that could not be covered by optical fiber
- The solution guarantees an emergency service for citizens by wireless LAN networks and IP TV cameras and mobile office vehicle with video-control systems
  - 35 km
  - 7 municipalities
  - 80 cameras
  - 20 km straight line covered
Thank You